JP 10-088,485

Job No.: 1505-97020 Ref.: JP10088485
Translated from Japanese by the Ralph McElroy Translation Company
910 West Avenue, Austin, Texas 78701 USA

JAPANESE PATENT OFFICE
PATENT JOURNAL (A)
KOKAI PATENT APPLICATION NO. 10[1998]-88485

Int. Cl.[5]:	D 06 M 16/00 D 06 L 1/12
Filing No.:	Hei 8[1996]-237725
Filing Date:	September 9, 1996
Publication Date:	April 7, 1998
No. of Claims:	3 (Total of 6 pages; OL)
Examination Request:	Not filed

METHOD FOR SCOURING FIBROUS MATERIAL COMPOSED OF ANIMAL FIBERS AND NATURAL CELLULOSE FIBERS

Inventors:

Masataka Funayama
Technology Laboratory,
Kurabo Industries Ltd.
14-5 Shimokita-cho,
Neyagawa-shi, Osaka-fu

Yushitoshi Maeda
Technology Laboratory,
Kurabo Industries Ltd.
14-5 Shimokita-cho,
Neyagawa-shi, Osaka-fu

Susumu Katsuen
Osaka Headquarter,
Kurabo Industries Ltd.
2-4-31 Hisataro-cho,
Chuo-ku, Osaka-shi, Osaka-fu

Hideyuki Kikumori
Tokushima Plant,
Kurabo Industries Ltd.
1-15 Tatsumi-cho,
Anan-shi, Tokushima-ken

Applicant: 000001096
Kurabo Industries Ltd.
7-1 Hon-cho, Kurashiki-shi,
Okayama-ken

Agents: Shigeru Aoyama, patent attorney,
and 1 other

[There are no amendments to this patent.]

Abstract

Purpose

To provide a method exhibiting good uniform dyeability by reducing the remaining amount of pectin without damaging fibers.

Solution means

A method for scouring a fibrous material composed of animal fibers and cellulose fibers, including a process for treating a fibrous material composed of animal fibers and natural cellulose fibers with a treatment solution containing at least a pectinase and a surfactant.

Claims

1. A method for scouring a fibrous material composed of animal fibers and cellulose fibers, characterized by including a process for treating a fibrous material composed of animal fibers and natural cellulose fibers with a treatment solution containing at least a pectinase and a surfactant.

2. The scouring method of Claim 1, characterized by the fact that the treatment solution further includes a cellulase.

3. The scouring method of Claim 1, characterized by the fact that the forms of the fibrous material are thread, yarn, woven fabric, knit fabric, nonwoven fabric, or secondary product.

Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention pertains to a method for scouring a fibrous material composed of animal hair fibers, especially wools and natural cellulose fibers.

[0002]

Prior art

Since natural fibers include a large amount of various impurities, they are scoured to remove these impurities to draw out properties intrinsic to the fibers and to secure a uniform dyeability before processing such as dyeing. For animal fibers, since the main impurity is an oil component, a surfactant is conventionally used as the main scouring agent. On the other hand, natural cellulose fibers such as cotton and hemp include pectin waxes, fats, pigments, ash, etc., as impurities which are removed by scouring with a strong alkaline substance.

[0003]

Blended fibrous materials such as wool, cotton and hemp are known as excellent materials with respect to the insulation and rigidity of wool, good hand of cotton and moisture absorption and toughness of hemp and cotton. If these blended fibrous materials of animal hair fibers and natural cellulose fibers are scoured under strong alkalinity much like fibers made only of, like natural cellulose, sometimes, the damage to the animal fiber component is severe, and even the fiber shape cannot be maintained. For this reason, the blended fibrous materials of animal hair fibers and natural cellulose fibers are conventionally scoured with a surfactant under a neutral or weakly alkaline conditions. However, in this method, since the pectin portion in the natural cellulose fibers is not sufficiently removed, the fibers obtained have inferior water absorption and uniform dyeability, so that products with a good value are difficult to obtain.

[0004]

Problems to be solved by the invention

In other words, the purpose of the present invention is to provide a method that exhibits a good uniform dyeability by reducing the remaining amount of pectin without damaging fibers in the scouring of a fiber product composed of animal hair fibers and natural cellulose fibers.

[0005]

Means to solve the problems

In other words, the present invention provides a method for scouring a fibrous material composed of animal fibers and cellulose fibers, including a process for treating a fibrous material composed of animal fibers and natural cellulose fibers with a treatment solution containing at least a pectinase and a surfactant. Furthermore, the present invention also provides a method that simultaneously applies a hand processing to the fibers, using a treatment solution containing a cellulase during the scouring.

[0006]

Also, the term "scouring" in this specification means a process that improves the water absorption and the dyeability of fibrous materials by removing impurities before sending the fibrous materials to a dyeing process.

[0007]

Embodiment of the invention

The animal hair fibers as a component of the fibrous material being treated in the method of the present invention are typically wools, and in addition to them, alpaca, mohair, angora, cashmere, etc., are mentioned. As the natural cellulose fibers, cottons and hemps are mentioned, and as the hemp or hemp-like fibers, ramie, linen, hemp, jute, Manila hemp, henequen, etc., are mentioned. The fibrous material composed of animal fibers and natural cellulose fibers provided to the method of the present invention may include one or more kinds of fiber components of both of them, regardless of their mixture ratio, and for example, blended yarns of animal fibers and natural cellulose fibers, twisted union yarns, woven fabrics and knit fabrics manufactured from said blended yarns or twisted union yarns, woven fabrics and knit fabrics manufactured by mixing-weaving or knitting animal fiber yarns and natural cellulose fibers, etc., are mentioned. As the forms of the fibrous material, thread, yarn, woven fabric, knit fabric, nonwoven fabric, etc., are included, and the fibrous material may also be treated after being sewn into secondary products such as shirts and blouses.

[0008]

In the scouring method of the present invention, the above-mentioned fibrous material composed of animal fibers and natural cellulose fibers is scoured with a treatment solution containing at least a pectinase and a surfactant in water.

[0009]

As the pectinase being used in the present invention, pectinesterase, polymethyl galacturonase, polygalacturonase, polymethylgalacturonate lyase, polygalacturonate lyase, protopectinase, pectinase, etc., are mentioned. Also, the pectinase produced by Erwinia bacteria (Cellulose Chemistry and Technology, Vol. 15, pp. 639-647 (1981)), pectinase produced by the of Streptomyces fragile bacterium, trademark Ultrazyme [transliteration] 40L made by Nobonoru Disk [transliteration] Bioindustry Co., commercial products, etc., are appropriately used.

[0010]

In the treatment solution, the pectinase is used at a concentration of 0.1-100 units/mL. Here, one unit of pectinase activity is the amount of oxygen that breaks down pectic acid and generates 1 μmol of galactoturonic acid for 1 min. If the amount of pectinase is less than 0.1 unit/mL, the effects of the present invention cannot be obtained, and if the amount exceeds 100 units/mL, further effects cannot be obtained, which is not preferable.

[0011]

The treatment solution used in the scouring method of the present invention further includes a surfactant. As the surfactant, any component used in washing animal hair fibers or component used as a scouring aid for natural cellulose fibers is appropriately used, and nonionic surfactants and anionic surfactants are suitable. As commercial products, for example, Granup [transliteration] VO-50K made by Sanyo Chemical Industries, Ltd., Liponox [transliteration] NCI made by Lion Corporation, Uomin [transliteration] TE and Uomin CS-3500 made by Tokai Seiyu Kogyo K.K., Sandpan [transliteration] AN Liquid and NP70E0 made by Clariant Japan Ltd., etc., are mentioned. The surfactant is added at 0.1-5 g/L, preferably 0.5-2 g/L to the treatment solution of the present invention, depending on the type. If the amount of surfactant is less than 0.1 g/L, the water absorption of the fibers is not sufficient, the dyeability is also poor, and dyeing irregularities are caused. On the other hand, if the amount exceeds 5 g/L, since foaming during treatment is severe, the enzyme is deactivated, and the effects of the present invention cannot be sufficiently exerted, which is not preferable.

[0012]

In the treatment solution used in the scouring method of the present invention, if desired, a cellulase may also be further added. If the cellulase is added, a hand processing can also be applied along with the scouring using the same bath As the cellulase used in the present invention, β-1,4-glycadase, β-glucosinase, cellobiase, cellulase, carboxymethylcellulase (CMCase), these compounds modified with water-soluble high-molecular substances, etc., are mentioned. As detailed examples of commercial products, there are Cellsoft [transliteration] 1.5 L made by Nobonoru Disk Bioindustry Co., GODO-ACD made by Godo Shusei Co., Ltd., Super Bio K-80 made by Rakudo Kasei Kogyo K.K., etc.

[0013]

In case the cellulase is added, the concentration is set to 2-50 units/mL, preferably 5-20 units/mL. Here, one unit of cellulase is the amount of oxygen that breaks down carboxymethylcellulose and generates a reducing sugar corresponding to 1 μmol glucose for

1 min. If the concentration of the cellulase is less than 2 units/mL, a sufficient hand workability cannot be obtained, and if the amount exceeds 50 units/mL, the strength of the fibers is considerably lowered, which is not preferable.

[0014]

In the treatment solution used in the scouring method of the present invention, aids such as soda carbonate, sodium hydrogencarbonate, soda phosphate, acetic acid, and soda acetate may also be added. In the scouring method of the present invention, the pH of the treatment solution may be in the range where each enzyme acts, however the pH is preferably in the range of 3-9.5 to avoid damage to the animal fiber component.

[0015]

The scouring method of the present invention may be applied using conventional apparatuses and sequences. For example, the batch type in which the fibers are immersed in the above-mentioned treatment solution or the treatment solution is sprayed or stirred using a high-pressure scouring crucible (Kier) and a liquid flow dyeing machine, cold pad batch type, continuous type using a continuous scouring machine with a conveyor steamer system, etc., are mentioned.

[0016]

In the method of the present invention, the scouring temperature may be the temperature at which the enzyme used acts, and it is typically 30-60°C. The scouring time is conventionally 20 min-2 h, preferably 20-60 min. If the scouring time is less than 20 min, a sufficient scouring is impossible. On the other had, even if the scouring is applied for more than 2 h, damage to the fibers is increased, and further scouring effects cannot be expected, which is not preferable.

[0017]

Before the fibrous material is supplied to the scouring method of the present invention, if necessary, the fibrous material is subjected to desizing. Conventional desizing agents and desizing methods may be appropriately selected in accordance with the kind of paste being used. For example, Neomalt [transliteration] H1 and Neomalt H5 made by Daiwa Kasei K.K., Biotex [transliteration] LS made by Nagase Biochemical Industry Co., Ltd., etc., are mentioned.

[0018]

If necessary, the fibrous material may be bleached before or after the scouring method of the present invention, and bleaching may also be simultaneously carried out during the scouring

of the present invention. As the bleaching agent, well-known bleaching agents may be used as long as they do not damage the fibrous material, for example, hydrogen peroxide, peracetic acid, hydrosulfite, soda sulfite, etc. Among them, hydrogen peroxide is especially preferable since the degree of fiber embrittlement is low and there is no recoloring. The bleaching may be carried out by any appropriate, conventional method. It may be carried out during desizing or after desizing as long as it is applied before scouring. In case the bleaching is carried out at the same time of scouring, the bleaching agent may be added to the treatment solution for scouring, and the bleaching effect is raised by increasing the temperature during scouring. Also, in case the bleaching is carried out after scouring, the bleaching agent may be added to the treatment solution after scouring.

[0019]

Though the bleaching is carried out at a relatively high temperature in many cases, the bleaching treatment temperature is preferably 80°C or less to prevent damage to the animal fiber component. Especially, the treatment time is preferably set to the range where the animal fiber component is not damaged. For example, in case hydrogen peroxide is used as the bleaching agent, 5-30 min is set. Next, the present invention is explained in further detail with application examples. The present invention is not limited to the following application examples.

[0020]

Application examples

Fibrous material used (Application Examples 1 and 2 and Comparative Example 1)

A blended twilled woven fabric of 30% wool and 70% cotton (warp yarns with a single yarn number of 20, weft yarns with a single yarn number of 10, a warp yarn density of 123 pieces/inch, and a weft warp density of 50 pieces/inch) was used. This blended twilled woven fabric was desized by a conventional method using an enzymatic desizing agent and prewashed for 30 min in boiling water.

[0021]

Application Example 1

A treatment solution containing 10 g/L (640,000 units/L) Ultrazyme 40 L (Nobonoru Disk Bioindustry Co.) as a pectinase and 2 g/L Liponox NCI (Lion Corporation) as a nonionic surfactant as prepared in water, and its pH was adjusted to 4.5 with acetic acid. Using a liquid flow dyeing machine (made by Hisaka Seisakuso K.K.), the fibrous material was scoured for 30 min under the conditions of a bath ratio of 1:10 and a temperature of 45°C. Then, it was washed with hot water at 80°C and dried for 30 min by a hot-air dryer at 80°C.

[0022]

Application Example 2

Using a treatment solution in which 5 g/L (20,000 units/L) 1.5 L Cellsoft (Nobonoru Disk Bioindustry Co.) as a cellulase was further added to the treatment solution of Application Example 1, the fibrous material was subjected to scouring, hot water washing, and drying treatments similar to those of Application Example 1. The product obtained had a soft hand similar to that of conventional hand-processed products.

[0023]

Comparative Example 1

Using 2 g/L of an aqueous Liponox NCI solution as a treatment solution, the fibrous material was subjected to scouring, hot water washing, and drying treatments similar to those of Application Example 1. The remaining amount of pectin, the water absorption, and the uniform dyeability of the fibrous material obtained in Application Examples 1 and 2 and Comparative Example 1 were investigated. The measuring methods were as follows.

[0024]

1) Remaining amount of pectin: The product was immersed in a 0.2 g/L aqueous ruthenium red solution with a bath ratio of 1:40, dyed by reciprocating and agitating at 30°C and 80 rpm for 10 min, lightly washed with water, and agitated at 100 rpm for 30 min in a hot bath with a bath ratio of 1:80 at 50°C. Then, it was dried in air, and the reflectance of a visible light of 540 nm was measured by a spectrophotometer (U-4000 type auto spectrophotometer made by Hitachi, Ltd.). The amount dyed K/S was calculated from the reflectance obtained by the Kubelka-Munk equation and defined as the remaining amount of pectin. It is shown that the smaller the K/S value, the smaller the remaining amount of pectin.

[0025]

2) Water absorption: The water absorption was measured according to JIS L 1096 6.26.1 water absorption rate A method (drop method) and B method (Birek method).

[0026]

3) Uniform dyeability: Using a dye solution of 69 g/L Sumifix Blue R (made by Sumitomo Chemical Co., Ltd.), dyeing was carried out at a squeezing rate of 70% by a conventional cold pad batch method. The uniform dyeability of the dyed product was evaluated by the naked eye of a special inspector panel of 10 people. The standards of the evaluation were as follows.

o: Good uniform dyeability

Δ: Dyeing irregularities are recognized.

x: Rope wrinkle irregularities and stripe irregularities are severe.

The evaluation results are shown in Table 1 below.

[0027]

Table 1

		ペクチン残存量 ①K／S	吸水性B(mm) ② 経 ⑤	緯 ⑥	吸水性A 秒 ③	均染性 ④
⑦	実施例1	3.53	100	94	0.8	○
⑧	実施例2	3.48	106	98	0.7	○
⑨	比較例1	4.57	79	60	3.5	Δ～×
⑩	未処理	7.20	5	3	>60	

Key:
1 Remaining amount of pectin, K/S
2 Water absorption B (mm)
3 Water absorption A, sec
4 Uniform dyeability
5 Warp
6 Weft
7 Application Example 1
8 Application Example 2
9 Comparative Example 1
10 Untreated

[0028]

Fibrous material used (Application Examples 3-5 and Comparative Example 2): A blended twilled woven fabric of 30% wool and 70% cotton (warp yarns with a single yarn number of 20, weft yarns with a single yarn number of 10, a warp yarn density of 123 pieces/inch, and a weft warp density of 50 pieces/inch) was used.

[0029]

Application Example 3

The above-mentioned blended twilled woven fabric was desized at a bath ratio of 1:10 and 95°C for 30 min by a liquid flow dyeing machine (Hisaka Seisakusho K.K.) using a desizing solution in which 10 g/L Neomalt H1 (Daiwa Kasei K.K.) as a desizing agent and 2 g/L Liponox NCI as a nonionic surfactant were dissolved in water. After discharging the desizing solution as a waste solution, a treatment solution in which 2 g/L (10,000 units/L) cellulase GODO-ACD (Godo Shusei Co., Ltd.), 10 g/L (64,000 units/L) pectinase Ultrazyme 40L (Nobonoru Disk

Bioindustry Co.), 8.3 mL/L 35% hydrogen peroxide solution, and 0.38 g/L soda carbonate were dissolved in water was put to the above-mentioned liquid flow dyeing machine, scoured at a bath ratio of 1:10 and 40°C for 20 min, heated to 80°C, and bleached for 20 min. After finishing the bleaching, the fibrous material was washed with hot water at 80°C and dried for 30 min by a hot-air dryer at 80°C.

[0030]

Application Example 4

The above-mentioned blended twilled woven fabric was desized similarly to Application Example 3, and the desizing solution was discharged as a waste solution. A treatment solution in which 2 g/L (10,000 units/L) cellulase GODO-ACD, 10 g/L (64,000 units/L) pectinase Ultrazyme 40L, and 0.06 g/L soda carbonate were dissolved in water was put to the liquid flow dyeing machine and scoured at a bath ratio of 1:10 and 40°C for 20 min. Then, 8.3 mL 35% hydrogen peroxide and 0.31 g/L soda carbonate were added to the treatment solution and bleached for 20 min after raising the overall temperature to 80°C. After finishing the bleaching, the fibrous material was washed with hot water at 80°C and dried for 30 min by a hot-air dryer at 80°C.

[0031]

Application Example 5

The above-mentioned blended twilled woven fabric was desized and bleached at a bath ratio of 1:10 and 95°C for 30 min by using a treatment solution in which 10 g/L Neomalt H1 as a desizing agent, 8.3 mL/L 35% hydrogen peroxide solution, and 2 g/L Liponox NCI as a nonionic surfactant were dissolved in water. After discharging the treatment solution for desizing and bleaching as a waste solution, a treatment solution in which 2 g/L (10,000 units/L) cellulase GODO-ACD, 10 g/L (64,000 units/L) pectinase Ultrazyme 40L, and 0.02 g/L soda carbonate were dissolved in water was put to the liquid flow dyeing machine and scoured at a bath ratio of 1:10 and 40°C for 20 min. After finishing the scouring, the fibrous material was washed with hot water at 80°C and dried for 30 min by a hot-air dryer at 80°C.

[0032]

Comparative Example 2

After desizing similarly to Application Example 3, a treatment solution in which 8.3 mL/L 35% hydrogen peroxide solution and 0.38 g/L soda carbonate were dissolved in water was put to the liquid flow dyeing machine and scoured at a bath ratio of 1:40 and 40°C for 20 min. Then, after finishing the bleaching, the fibrous material was washed with hot water at

80°C and dried for 30 min by a hot-air dryer at 80°C, so that a product of Comparative Example 2 was obtained.

[0033]

The remaining amount of pectin, the whiteness, the tear strength, the tensile strength, and the uniform dyeability of the products obtained in Application Examples 3-5 and Comparative Example 2 were evaluated by the same methods as mentioned above. The other evaluating methods were as follows.

[0034]

1) Whiteness: L, a, and b values of four positions on the fabrics being tested were measured, and the values were averaged. In the light measurement, a color difference colorimeter CR-200 (made by Minolta Co., Ltd.) was used. From the L, a, and b values obtained, the whiteness was obtained from the following equation: whiteness = $100 - \{(100 - L)^2 + a^2 + b^2\}^{1/2}$ based on the Hunter method.

[0035]

2) Tear strength: It was measured according to JIS L 1096 (fiber tear testing method).

3) Tensile strength: It was measured according to JIS L 1096 (fiber tensile testing method). The results are shown in Table 2.

[0036]

Table 2

		①	②	③		④		⑤
		ペクチン残存量 (K/S)	白色度	引裂強度(gf) ⑥ タテ	⑦ ヨコ	引張強度(kgf) ⑥ タテ	⑦ ヨコ	均染性
⑧	実施例3	4.01	84.7	3150	4724	>100	96	○
	実施例4	3.76	85.1	2970	4458	>100	93	○
	実施例5	3.92	84.3	3140	4511	>100	93	○
⑨	比較例2	4.15	84.5	3000	5593	>100	93	△
	原布	7.58	81.4	2920	4360	>100	91	

Key:
1 Remaining amount of pectin (K/S)
2 Whiteness
3 Tear strength (gf)
4 Tensile strength (kgf)
5 Uniform dyeability
6 Warp
7 Weft
8 Application Example __

9 Comparative Example 2
Raw fabric

[0037]

Also, for the fibers obtained in Application Example 3, the state of the fibers before and after treatment was observed by an electron microscope. A photograph showing the state before treatment is shown in Figure 1, and a photograph showing the state after treatment is shown in Figure 2. As seen from the photographs, in the scouring using the method of the present invention, no damage is done to the animal hair fibers.

[0038]

Effects of the invention

The scouring method of the present invention has mild conditions and does little damage to fibers. Therefore, in a fibrous material composed of animal hair fibers and natural cellulose fibers scoured by the method of the present invention, the strength is not decreased by the scouring, and excellent water absorption and good dyeability are displayed. Bleaching is also simultaneously applied by mixing a bleaching agent during scouring , and at that time, the fibers exhibit good whiteness. Also, since the remaining amount of pectin component is small, an excellent fibrous material which has no dyeing irregularities, rope wrinkles or stripe irregularities caused by insufficient removal of pectin can be obtained.

Brief description of the figures

Figure 1 is a photograph showing the state of fibers of a fibrous material before the treatment of Application Example 3.

Figure 2 is a photograph showing the state of fibers of a fibrous material after the treatment of Application Example 3.

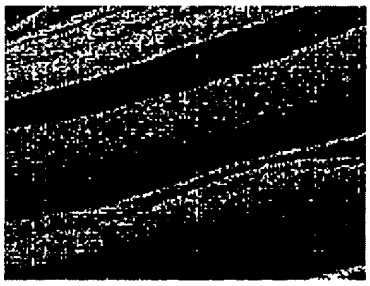

Figure 1

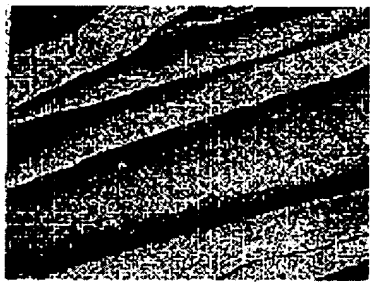

Figure 2